THE ROLE OF LNG IN THE EURO-MEDITERRANEAN REGION (EMR): REGULATORY AND POLICY MEASURES FOR ADVANCING THE LNG HUB DEVELOPMENT AND THE SMALL SCALE LNG BUSINESS IN THE REGION

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Enagás S.A.

ABSTRACT

In 2017 the Euro-Mediterranean Region imported around 20% of the total worldwide LNG volumes from more than 13 different countries. It produced more than 6% of total worldwide LNG exported volumes. LNG is also gaining a growing role as a tool for flexibility, monetisation of gas reserves, reduction of emissions and economic growth.

The paper will assess the current role played by LNG in the Euro-Mediterranean area. It will take into account the supply, regulatory, infrastructure and trading developments in the region as well as the new uses of LNG. The opportunities for the development of a more liquid, well-functioning and integrated LNG market will be identified. Moreover, justified reasons will be provided to facilitate the development of LNG logistic hubs in the region, and further advance the Small Scale LNG business, including the use of LNG as maritime fuel.

Expected Results:

Our analysis indicates that the Euro-Mediterranean Region is ideally well-placed for playing a bigger role in the global LNG market through increased LNG volumes, the development of LNG logistic hubs and the further promotion of the Small Scale LNG business. For this to happen, a strengthened cooperation among Euro-Mediterranean countries is needed, and concrete regulatory measures should be implemented on a coordinated, timely and effective manner.

The further development of LNG business will bring benefits for the region, in terms of prosperity, stability and achievement of energy and climate goals.
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1. Introduction

The Euro-Mediterranean Region (EMR) is a very active region in the LNG business. In 2017 this region imported around 20% of the total worldwide LNG volumes from more than 13 different countries. It produced more than 6% of total worldwide LNG export volumes and it was responsible for around 80% of the global LNG re-exported volumes.

While the Global LNG trade has been substantially growing during the last decade moving from 198 billion cubic metres (bcm) in 2006 to 365 bcm in 2017 (almost double amount), the EMR has had a much more moderated growth in LNG imports, with 55 bcm being imported in 2006 and 70 bcm in 2017. Moreover, LNG production in the EMR has decreased by almost 50% from 37 bcm in 2006 to 16 bcm in 2017.

For the past decades, LNG has been for the European Union (EU) a key driver of supply diversification, security of supply and increased competition. LNG has been also gaining a growing role as a tool for flexibility and economic growth. In order to take all the advantages from LNG, it is necessary to ensure an optimal use of and access to LNG infrastructure, allowing these facilities to develop its full potential in those regional markets where they are based. It is also important to complete the full implementation of the existing legislation within the EU, namely the 3rd Energy Package and the Network Codes, so that the EU gas market becomes more integrated and well-functioning.

LNG is a key player in the EMR for different reasons:

a) **As a potential energy source for higher diversification, gas security and gas competition:**

   Natural gas already plays an important role both in the energy mix and within the electricity generation mix of the EMR countries, including the South and East Mediterranean ones. Despite uncertainty around the future EU gas demand, there is a wide agreement that, following the declining domestic gas production, the EU is set to become even more dependent on external gas supplies. The EU gas market will have to find additional sources of gas. EU may need more than 100 bcm/y of additional gas by 2030 from “other” sources. Due to its vast, untapped gas resources and to its geographical proximity to Europe, the EMR could provide an important contribution to LNG consuming countries in terms of affordable, secure and diversified energy.

b) **As a way to fight Climate Change, reduce Green House Gas (GHG) emissions, and improve Air Quality:**

   The Mediterranean region is starting to face serious climate change effects, and this trend will even worsen in the short/medium term. Air quality is also becoming a serious issues in very dense populated areas. Therefore, the emissions are a problem to be addressed. Every country in the EMR is looking for a successful energy transition taking into consideration its national circumstances, needs and priorities. This transition can be based on the abundant natural gas sources which are present in the region. Natural gas can be used for conventional use (power, industry, etc.), but also for uses related to the mobility sector (road and maritime).

c) **As a connecting element of the regional gas market and a tool to bring prosperity and stability into the EMR:**

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1 The EMR mainly includes all the countries covered by the Union for the Mediterranean (UfM), i.e., 28 European Union Member States and 15 countries from the Southern and Eastern shores of the Mediterranean.
LNG should be seen as a connecting element of the Euro-Med gas market enabling energy and monetary flows between different countries. LNG also acts as a catalyst for the cooperation between market players, NRAs, infrastructure operators and Governments across the EMR, promoting regional dialogue, partnership and cooperation in the Euro-Mediterranean.

![Figure 1: LNG in the EMR vs Global LNG Market (Source: GIIGNL Industry Reports)](image)

2. The Role of LNG in the Euro Mediterranean Region (EMR)

The EMR has been the world’s pioneer region on LNG. In January 1959, the world’s first LNG tanker, the Methane Pionner, a converted World War II liberty freighter, carried an LNG cargo from Lake Charles, Louisiana, to Canvey Island, United Kingdom. With the start-up of Arzew GL4Z or Camel plant in 1964, the UK became the world’s first LNG importer and Algeria the first LNG exporter. Algeria has since become a major world supplier of natural gas and LNG. In 1970, the Marsa El Brega liquefaction plant came on stream in Libya and gradually, with Algeria and Libya in operation, other European countries and the US became LNG commercial importers: Barcelona (Spain) in 1969; La Spezia (Italy) and Everett (US) in 1971; and Fos (France) in 1972.

Within the EMR the LNG supplies reached a peak in 2011 with more than 80 bcm being imported into the region. After 2011, the LNG imports decreased drastically following Fukushima and other reasons, and they did not start to recover until 2015. Since 2015 the LNG supplies have been growing again, but they have not reached yet the maximum value observed in 2011. While EMR LNG imports have increased around 25% in the last 12 years, the global LNG trade has grown from 200 bcm to +350 bcm, i.e. +80%. The Figure 2 shows how the EMR has not been able to follow the LNG global trends.

LNG plays different roles in different LNG importing countries. LNG represents a relevant source of energy in the total primary energy mix, taking a share below 10% for the majority of importing countries but being in the range 10 - 45% for a few of those importing countries (see Figure 3).
Compared with the global natural gas supplies (via pipeline or LNG terminal), LNG imported volumes into the EMR have different weights in the total gas supplies portfolio. While for many countries, LNG represents around 10-15% of the total imported gas volumes, for other countries, LNG has much more relevance, reaching even 100% of the total gas consumed in one country. (see Figure 4)
Regarding LNG exports, the EMR has also experienced a trend totally different from the rest of the world. While global LNG exports have been growing during the last 12 years, with a total growth of +80%, in the case of the EMR, the LNG sold went down -26% over the same period. (see Figure 5)

LNG commercial flows within the EMR are also very different from country to country. Algeria, as the main LNG exporter has France and Turkey as the top destinations of its LNG. On the other side, Netherlands is the country...
importing lowest amount of LNG from the EMR. The total LNG intra-trade within the EMR has decreased by more than 50% since 2006, while global LNG trade increased by more than 80% over the same period (see Table 2).

<table>
<thead>
<tr>
<th>Import Export</th>
<th>Spain</th>
<th>France</th>
<th>Turkey</th>
<th>Italy</th>
<th>UK</th>
<th>Portugal</th>
<th>Greece</th>
<th>Netherlands</th>
<th>Egypt</th>
<th>Jordan</th>
<th>Malta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>2.5</td>
<td>4.1</td>
<td>4.15</td>
<td>0.8</td>
<td>0.2</td>
<td>0.25</td>
<td>1.2</td>
<td>0.05</td>
<td>0.51</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>Egypt</td>
<td>0.08</td>
<td>0.07</td>
<td>0.07</td>
<td>0.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.02</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1: LNG trade flows between EMR LNG Producing Countries and EMR Importing Countries in 2017 (Source: GIIGNL)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total intra-trade (bcm) within the EMR</td>
<td>29.6</td>
<td>24.84</td>
<td>24.22</td>
<td>27.16</td>
<td>22.56</td>
<td>19.85</td>
<td>15.36</td>
<td>12.57</td>
<td>13.51</td>
<td>12.76</td>
<td>13.73</td>
<td>14.3</td>
</tr>
<tr>
<td>Total Global trade (bcm)</td>
<td>199</td>
<td>213</td>
<td>215</td>
<td>227</td>
<td>276</td>
<td>304</td>
<td>298</td>
<td>299</td>
<td>301</td>
<td>310</td>
<td>326</td>
<td>365</td>
</tr>
</tbody>
</table>

Table 2: Evolution of LNG trade flows (between EMR LNG Producing Countries and EMR Importing Countries) and comparison against LNG Global Trade. (Source: GIIGNL Industry reports)

When looking to the geographical destinations for LNG exports originated in the EMR, Figure 6 clearly shows the reduction of LNG exported volumes over the last 12 years, and how the remaining LNG exported volumes from Algeria and Egypt are today targeting those markets which are closer to the production countries, i.e. the Euro-Mediterranean region.

![Figure 6: Geographical destinations for LNG exports from the Euro-Mediterranean Region (bcm)](Source: GIIGNL Industry reports)

The future evolution of LNG production and consumption in the EMR is uncertain. The latest supply outlooks are presenting a strong growth for the LNG market at worldwide level being Asia, followed by Europe, the regions where LNG consumption is expected to grow more. LNG is expected to grow by 31% in total from 2017 to 2035. EMR should be able to take advantage of this, and find its place in the future LNG business.
3. LNG Infrastructure

Import Infrastructure

Today the Euro-Mediterranean Region is very well equipped with 35 LNG receiving terminals, including 32 large-scale LNG regasification facilities (either onshore/offshore terminals or FSRUs) and 3 small\(^2\) LNG terminals.

In total, all of them provided an aggregated regasification capacity of more than 260 bcm/y and represent around 25% of the installed LNG regasification capacity in the world. More details about aggregated capacities per country, geographical location, and third-party access regime can be found in table 3 and figures 9 and 10.

<table>
<thead>
<tr>
<th>Country</th>
<th>Current Number of Terminals</th>
<th>Nominal Send-Out Capacity (bcm/y)</th>
<th>Storage Capacity (m(^3) LNG)</th>
<th>Autonomy Days</th>
<th>FSRU</th>
<th>Additional Number of LNG Regasification Terminals</th>
<th>Additional Planned Send-Out Capacity (bcm/y)</th>
<th>Additional Planned Storage Capacity (bcm/y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>-</td>
<td>1 (FSRU)</td>
<td>230,000</td>
<td>4 - 8</td>
<td>1</td>
<td>230,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium(^3)</td>
<td>1</td>
<td>9</td>
<td>386,000</td>
<td>9.2</td>
<td>-</td>
<td>3</td>
<td>180,000</td>
<td></td>
</tr>
<tr>
<td>Croatia</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1 (FSRU)</td>
<td>2.6</td>
<td>N/P</td>
<td></td>
</tr>
<tr>
<td>Egypt</td>
<td>2</td>
<td>13</td>
<td>340,000</td>
<td>5.6</td>
<td>Yes (2)</td>
<td>2</td>
<td>210,000-480,000</td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finland(^4)</td>
<td>1</td>
<td>0.11</td>
<td>30,000</td>
<td>58.2</td>
<td>2</td>
<td>0.5 - 1</td>
<td>80,000</td>
<td></td>
</tr>
</tbody>
</table>

\(^{2}\) Small Terminals is defined for this paper as an LNG receiving terminal with less than 50,000 m\(^3\) of LNG storage.

\(^{3}\) Belgian LNG regasification terminal is under expansion.

\(^{4}\) The new LNG terminals presented as “planned” are much advanced and considered as “committed/under construction”
<table>
<thead>
<tr>
<th>Country</th>
<th>FSRUs</th>
<th>LNG Capacity (MMBTU)</th>
<th>LNG Capacity Utilisation (%)</th>
<th>LNG Available Storage Capacity (MMBTU)</th>
<th>LNG Regasification Capacity (MMBTU)</th>
<th>2018 LNG Import (MMBTU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>4</td>
<td>1,370,000</td>
<td>8.5</td>
<td>10.75</td>
<td>410,000</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3 (1 FSRU)</td>
<td>&gt;18</td>
<td>&gt;350,000</td>
</tr>
<tr>
<td>Greece</td>
<td>1</td>
<td>225,000</td>
<td>6.8</td>
<td>1 (FSRU)</td>
<td>6</td>
<td>170,000</td>
</tr>
<tr>
<td>Israel</td>
<td>1</td>
<td>138,000</td>
<td>6.1</td>
<td>Yes</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ireland</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2 (1 FSRU)</td>
<td>13.7</td>
<td>&gt;800,000</td>
</tr>
<tr>
<td>Italy</td>
<td>3</td>
<td>487,500</td>
<td>7.1</td>
<td>Yes (1)</td>
<td>2</td>
<td>24.5</td>
</tr>
<tr>
<td>Jordan</td>
<td>1</td>
<td>160,000</td>
<td>4.6</td>
<td>Yes</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Latvia</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1 (FSRU)</td>
<td>0.5</td>
<td>N/A</td>
</tr>
<tr>
<td>Lebanon</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Lithuania</td>
<td>1</td>
<td>170,000</td>
<td>9.1</td>
<td>Yes</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Malta</td>
<td>1</td>
<td>125,000</td>
<td>38.1</td>
<td>Yes (FSU)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Morocco</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>5</td>
<td>150,000</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1</td>
<td>540,000</td>
<td>9.6</td>
<td>-</td>
<td>4</td>
<td>180,000</td>
</tr>
<tr>
<td>Poland</td>
<td>1</td>
<td>320,000</td>
<td>13.7</td>
<td>1 (FSRU)</td>
<td>6.6 - 10.7</td>
<td>350,000</td>
</tr>
<tr>
<td>Portugal</td>
<td>1</td>
<td>390,000</td>
<td>11</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Spain</td>
<td>7</td>
<td>3,616,500</td>
<td>11.2</td>
<td>-</td>
<td>2</td>
<td>2.6</td>
</tr>
<tr>
<td>Sweden</td>
<td>2</td>
<td>50,000</td>
<td>10.6</td>
<td>-</td>
<td>1</td>
<td>6.5</td>
</tr>
<tr>
<td>Turkey</td>
<td>4</td>
<td>943,130</td>
<td>7.6</td>
<td>Yes (2)</td>
<td>1</td>
<td>12 - 17</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>3</td>
<td>2,095,000</td>
<td>9.3</td>
<td>-</td>
<td>2</td>
<td>17.2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>35</td>
<td>11,386,130</td>
<td>8.9</td>
<td>9</td>
<td>24 (12 FSRU)</td>
<td>&gt;150</td>
</tr>
</tbody>
</table>

Table 3: LNG terminals (existing and planned) in the EMR region (dataset from 2018) – [Source: GIIGNL, GLE, Public Sources]
N/P: Not publicly available  N/A: not applicable

The EMR has experienced a sharp increase in the number of FSRUs during the last years and more FSRUs are coming into stream soon. The 9 existing FSRUs currently in operation within the EMR are about 1/3 of the total FSRUs in the global at the end of 2017. Looking to the EMR, the 9 FSRUs in operation represent more than 16% of the total LNG regasification capacity, and more than 10% of the LNG storage capacity.

Despite the large capacity in the region, the LNG regasification terminals have remained largely under-utilised during the past years (see Figure 8) due to different reasons, namely the high spot prices in Asia and South

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5 The new LNG terminals presented as “planned” are much advanced and considered as “committed/under construction”
America, the shale gas revolution in USA, and the economic crisis in Europe which condemned non-competitive CCGTs to redundancy in light of shrinking electricity demand and abundant renewable electricity with low marginal costs.

In 2017, the EMR large regasification terminals imported a little more than 70 bcm of LNG.

Considering the available send-out regasification capacity in the region, the regional average utilization ratio of large LNG regasification terminals during 2017 was around 28%. Nevertheless, LNG terminal utilization in Europe varies widely from country to country.

![Figure 8: LNG imported by large LNG terminals vs. Large LNG Terminals Utilisation Factor (%)](image)

Despite the current low utilisation of the EMR’s LNG Terminals, there are numerous LNG projects planned. A few LNG projects are currently “under construction” or “committed”. In January 2019, only one LNG regasification terminal (Zeebrugge) is under expansion. Four LNG terminals are either committed or under construction: 2 Gascan terminals in the Canary Islands, and two in Finland. One FSRU in Turkey has recently started in late 2018.

The large number of LNG regasification projects under study/planned, around 25 in total, either for construction of new terminals or expansion of the existing ones, should be taken carefully. It is still not clear how many of these announced/planned projects will be finally executed and, most likely, a relevant number of them will end up being cancelled or abandoned.
Figure 9: Existing/Under construction Large Scale LNG Regasification Terminals
Figure 10: Planned Large Scale LNG Terminals
(Source: Gas LNG Europe – GLE, GIIGNL and other public sources)
Export Infrastructure

The global nominal liquefaction capacity has grown to 441 bcm/y as of January 2017, an increase of approximately 45.5 bcm/y relative to end-2015. The project delays and outages during 2016 limited the effect of the anticipated imbalance in the LNG market. Within the EMR the liquefaction capacity has remained quite stable during the last years (see Table 4)

<table>
<thead>
<tr>
<th>Current Number of Terminals</th>
<th>Nominal Send-Out Capacity (bcm/y)</th>
<th>Storage Capacity (m³ LNG)</th>
<th>Additional Planned Number of Liquefaction Terminals</th>
<th>Additional Planned Send-Out Capacity (bcm/y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>4</td>
<td>32.89</td>
<td>1,070,000</td>
<td>-</td>
</tr>
<tr>
<td>Egypt</td>
<td>2 (operational)</td>
<td>9.36 (operational)</td>
<td>560,000 (operational)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1 (stopped)</td>
<td>6.5 (stopped)</td>
<td>300,000 (stopped)</td>
<td>-</td>
</tr>
<tr>
<td>Libya</td>
<td>1 (stopped)</td>
<td>0.78</td>
<td>96,000</td>
<td>-</td>
</tr>
<tr>
<td>Cyprus</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>N/P</td>
</tr>
</tbody>
</table>

N/P: Information No Publicly available

Table 4: Liquefaction capacity in the EMR – data 2018 (Source: GIIGNL)

In terms of historical evolution associated to the utilisation of Liquefaction Terminals in the EMR, the Figure 9 shows again a decreasing trend from 2006 until 2014, followed by a period of stable exports without substantial growth:

Figure 11: LNG Supply Outlook – Global level and by region (Shell Energy Outlook 2018)
With the exception of a possible LNG liquefaction terminal in the Island of Cyprus, there are not announced new liquefaction projects in the region. However the on-going gas fields discoveries in the East-Med region could boost the liquefaction in that part of the Mediterranean.

4. Regulation for LNG import EU Terminals and the EU Strategy

LNG terminals are specific infrastructures whose position in the gas production chain may vary from one country to another. Formerly, they were considered to be essential infrastructures as part of the downstream gas infrastructures (like transmission gas pipelines) and were thus subject to regulated Third Party Access (rTPA). However, in order to encourage investment, most terminals built in the EU after 2005 have obtained regulated third party access exemptions.

In the case of an exempted terminal, however, the regulator has to examine the exemption and ensure that the terminal’s access conditions are sufficiently transparent and do not distort competition. Well-functioning use-it-or-lose-it and secondary capacity markets can support this at exempted terminals. In both cases (rTPA and exemption), security of supply and market fluidity will be enhanced by greater information and more transparency.

On 16 February 2016, the European Commission published a Package of proposals focusing on gas security of supply. This Package included a Communication on an EU strategy for liquefied natural gas (LNG) and gas storage.

The Commission’s strategy aims to exploit the potential of LNG and storage to make the EU gas system more diverse and flexible, thus contributing to the key Energy Union objective of a secure, resilient and competitive gas supply. In order to achieve this goal, it focuses on three main themes: completing missing infrastructure, completing the internal gas market, and the EU as a player on international gas markets. The EU’s Strategy proposes:

- Building the necessary missing infrastructure to allow all members to access international LNG markets, either directly or indirectly via neighbouring Member States.
- Completing the internal gas market based on appropriate commercial, legal and regulatory aspects. Continued implementation of all the provisions should ensure the emergence of a fully functioning and liquid internal gas markets.
- Working with international current and potential LNG suppliers to promote liquid and transparent global LNG markets resilient to external shocks.
- Promoting the sustainable use of LNG as alternative fuel in transport, heat and power.

The creation of liquid and competitive markets, so that LNG and other new gas supplies can reach and compete in previously isolated markets, is of fundamental importance to achieving the objectives of the Energy Union. The Commission’s analysis indicates that full implementation of the key Projects of Common Interests (PCIs) highlighted by the European high level groups will remove, or at least mitigate, the main vulnerabilities identified by
the gas stress tests. It is therefore vital that the missing pipeline links are rapidly built, and that all necessary measures are taken to promote liquidity, price convergence and competitive markets, especially in those countries with less access to LNG and other competitive gas sources.

Since the publication of the European Commission’s Strategy for LNG (Feb 2016), significant progress is being made.

5. Small Scale LNG

The EU regasification terminals have adapted their services to market conditions, providing flexible services and developing small-scale LNG infrastructure. Those new services and infrastructures that have been developed are making a valuable contribution to the fulfilment of EU policies and regulations related to the fighting climate change, improvement of air quality and use of alternative fuels in the transport sector. In many aspects, small-scale LNG services and infrastructure not only contribute to increasing regional security of supply but also participate in reducing Green House Gas (GHG) emissions. The Small Scale LNG services offered in Europe include:

- **Reloading**: transfer of LNG from the LNG storage of the terminal into a vessel. Reloading services are offered in 16 LNG regasification terminals, located in Belgium, France, Lithuania, the Netherlands, Portugal, Spain and the United Kingdom (UK). The volumes re-exported have almost quadrupled from 2010 to 2014 but, since then, the amount re-exported has been decreasing.

![Figure 12: LNG re-exported volumes (bcm) from Large Scale LNG Terminals located in the Euro-Mediterranean Region (Source: GIIGNL Industry Reports)](image)

- **Gas transfer routes** through truck loading (LNG is loaded on tank trucks which transport LNG in smaller quantities) is the usual service. Rail loading services (LNG is loaded on rail tanks which transport LNG in smaller quantities) are not offered in Europe yet, but some projects are being developed.
Gas Transfer routes are particularly useful in countries where the pipeline network infrastructure is not reaching yet all the areas, as a first penetration method into that area. It is also used where the investment cost for connecting gas users to the grid is uneconomic. A gas transfer route infrastructure might consist of:

- LNG regasification plant receiving the LNG,
- Truck loading station at the LNG regasification plant
- LNG trucks to transport the LNG to remote locations using existing road infrastructure
- Storage and Regasification in LNG Satellite plants, usually connected to industrial and transport consumers, or to local distribution networks.

The truckloading business started in Spain several decades ago. Today, different LNG import countries are developing quickly this service, but Spain still represents the vast majority of the LNG truckloaded within the EU.

**Figure 13: Truckloading Operations at LNG Regasification Terminals in the EMR (bcm)**
(Source: GIE/GLE)

- **LNG Bunkering**: LNG is available as a ship fuel and ships can be fuelled with LNG at ports with LNG bunkering facilities. Bunkering directly from the LNG terminal is also possible. The first bunkering operation, supplying LNG directly from the LNG regasification terminal to the LNG-fuelled ship, took place in April 2017 in Spain.

- **Ship to Ship LNG Refuelling**: As well as ship refuelling from bunkers, ships can also be refuelled by transfer from other ships.

- **Trans-shipment**: direct transfer of LNG from one vessel into another. This service is proposed in terminals in France, Spain, UK, and since 2015 in Belgium and the Netherlands.
• **Loading of bunker ships**: LNG is loaded on bunkering ships (stationary facility which bunkers LNG to be used as a fuel for vessels) which supply to LNG-fuelled ships or LNG bunkering facilities for vessels. There are 15 LNG bunkering stations in Europe. This service is proposed in Belgium, France, the Netherlands and Spain.

• **LNG refuelling stations**, which facilitates the use of LNG as a fuel for road mobility.

LNG has the potential to improve air quality and reduce current environmental impacts, for example in the transport sector when it replaces fuels such as diesel or heavy fuel oil. The use of LNG in trucks and shipping can reduce emissions of various pollutants and, in the case of shipping, it can allow the sector to meet the requirements for decreasing the Sulphur and nitrogen content in marine fuels used in the Emission Control Areas and set by the International Maritime Organisation (IMO). In both cases the use of LNG can reduce greenhouse gas emissions, in particular when blended with liquid biomethane, provided methane emissions are minimised. Similar considerations can apply to small scale LNG use for heat and power.

The EMR governments should support even more the growth of LNG as an alternative fuel where it replaces more polluting conventional fuels on a consistent way with their sustainability goals.

The precise environmental impact will depend on a range of factors at different points in the LNG supply chain, and should be assessed case by case. A key factor in this regard (as for pipelines and for natural gas use in general), is the amount of any methane emissions. Manufacturers and operators of LNG facilities or technologies are constantly working to minimise such emissions and hence the overall greenhouse gas impact of LNG use.

**Figure 14**: Environmental benefits of LNG compared to traditional oil-based fuels (Source: GasNaturally)

**6. Contract and prices evolution in the EMR**

Significant changes have been taking place in the LNG markets over the past 10 years. Among others, the US “shale revolution” since 2006, March 2011 Tsunami and subsequent nuclear crisis in Japan as well as the plummeting oil prices since mid-2014 have shifted the dynamics of global LNG markets. These changes have
naturally affected not only the supply-demand expectations but also price formation mechanisms and contract terms.

Since 2011, there has been a decoupling between spot prices of coal and gas in the EU. Coal prices have dropped significantly making gas less economically attractive for power generation. At the same time, positive developments have been taking place in terms of movements towards more gas hub trading in Europe. The importance of those hubs, particularly the Dutch TTF hub, are likely to continue in the future not only as a global pricing foundation and a key reference for European gas market and globalising LNG market, but also for the formation of a more liquid, transparent and flexible global gas market.

In Europe, there has been a move towards indexation to gas hubs from traditional indexation to price of oil products with discounts which has been in place since 1962.

In 2018, around 70% of LNG trades are on long term contracts, following lengthy contract negotiations. Around 30% are on short term and spot trades. The current statistics are showing a clear trend towards shorter long-term contracts, with more destination flexibility and lower contracted volumes. The market players are much less likely to sign 20-years long-term contracts. Instead they move towards contracts around 7-9 years duration. This means that the LNG market is becoming more flexible and liquid, with multiple sellers and buyers, more transactions of smaller volumes, and where market prices (hubs) are playing an increasing role. As a result, the appetite for long-term and large LNG supply contracts is being reduced quickly.

![Pricing Mechanisms in European Gas Imports](image)

7. LNG Hub

When large volumes of LNG storage are available, this means that cargoes can be dropped off and collected continuously. Although LNG cannot be stored economically for long term because of the effects associated to the
boil off, when the storage is large enough and there is a continuous top up and withdrawn of LNG, then LNG storage can be provided effectively and on a competitive manner, even for the long-term.

The EMR has enough LNG storage capacity, and this is especially true in the case of Spain, to promote the development of LNG logistic hub(s), where LNG can be traded in liquid form for the short and long-term. The existence of a LNG hub would bring increased liquidity and higher security of gas supply by deliberately bringing about an LNG spot market, setting up a trading hub and providing a price reference point. As a result of this LNG hub, LNG becomes more tradable and accessible for the whole region. A liquid LNG would make available LNG volumes on a continuous basis, be them for injection into the gas grid, for re-exportation, for loading into LNG trucks, or for use as fuel in road and maritime transportation. Both the LNG business and the whole EMR could benefit from the advantages provided by an LNG hub. In other parts of the world they are already working on that (e.g. Singapore).

8. Conclusions

- **LNG is set to play a key role in EMR’s energy mix**: Due to its vast, untapped gas resources, to its geographical proximity, and to the existing infrastructure already available, EMR has the required ingredients to benefit from increasing trade of LNG, in terms of security of supply, diversification, competitiveness, environmental advantages, prosperity and stability in the region.

- **Free Flow of LNG across the borders is required**: LNG regasification terminals have a regional dimension beyond the borders of the country where they are located: Efforts should be made to build the missing links and to implement required measures in the EMR for the creation of liquid, integrated and competitive markets where LNG, once regasified, can flow freely across the border towards those areas where it is valued the most. Every importing country in the EMR should have access to LNG, either directly or indirectly through a neighbouring country. This would allow the EMR to take the full benefit from LNG in terms of supply competition, liquidity, price convergence, diversification, alternative fuels/sustainability, etc. and would increase the global trade of LNG.

- **LNG trade expected to grow in the following years**: Natural gas trade is expected to grow, both globally and at the EMR level. However, LNG trade will grow faster than natural gas trade. LNG producing countries in the EMR could consider implementing measures to recover and increased LNG production in line with the increasing global LNG trade evolution. This would allow them to keep their market shares and ensure/grow their revenue levels.

- **Many planned LNG regasification terminals but without clear indications on whether they will be finally built or not**: Currently there are little number of LNG regasification terminals under construction or committed. The amount of planned regasification projects is much higher, although their probabilities of being executed have to be assessed carefully; probably a large majority of those planned projects will be abandoned or cancelled.

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6 This conclusions is aligned with the European Commission Communication on the Energy Union (“A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy”, Feb 2015), it is stated the following in page 2: “Our vision is of an integrated continent-wide energy system where energy flows freely across borders, based on competition and the best possible use of resources,”
Increased popularity of FSRUs in the EMR: There is a clear trend towards the use of FSRU in the EMR. This is justified by its lower construction and installation timings (a floating solution can be commissioned in less than two years, compared to three to five years for land-based solutions of comparable sizes), the social acceptance of those projects (lower environmental footprint due to less land use), the lower dimensions and thus total capital costs, the possibility of accessing remote markets and the uncertainty about future gas demand (the FSRU can be moved to new markets if not needed anymore).

LNG logistic hub(s): gas hubs already exist in the EMR to trade natural gas, such as NBP, TTF and other hubs. Following the example of other regions, LNG physical/logistic hubs (where LNG volumes are entering, being stored and exiting according to market needs), should be explored within the EMR. For this to happen, enough LNG storage capacity, access to diversified sources of LNG, harmonised access conditions to the physical/logistic LNG hub would be, among others, an advantage for such development.

Convenience of harmonisation of contracts: A standard contract, at least for spot and possibly short-term contracts, is essential for the development of LNG trading.

Shorter and more flexible LNG contracts: LNG market players are demanding more flexible and shorter long-term contracts, with lower volumes involved. The duration of long-term contracts is being reduced (difficult to see long-term contracts of 20 years, but more likely long-term contract with duration below 10 years). The Spot & Short-term trade is developing and growing fast. Nevertheless, to develop new infrastructure projects still long-term commitments (either with the user and/or the regulator) are necessary.

LNG role in unlocking gas reserves in the East-Med region: the alternative of using (new/existing) LNG liquefaction capacity plant in the East-Med region can offer security, optionality, huge benefits in terms of flexibility and adequacy to mobilise and monetise a major part of the gas reserves discovered in the East-Med region.

Air Quality: LNG can, without doubts, help to improve air quality in many cities across the EMR, reducing to a large extent emissions of CO₂, NOx, SOx, and Particulate matter emissions.

Small Scale LNG and Alternative Uses of LNG: the EMR offers enormous potential for the development of Small Scale LNG activities, related not only to the provision of new logistic services at the LNG regasification terminals, but also to the use of LNG as alternative fuel for maritime and road transportation.

LNG is well positioned to enhance competitiveness, prosperity, stability and emissions reductions in the EMR.
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